

Easter Island: A Pathway to Sustainable Development

Petra Campbell*

Remote Easter Island, a 166 square kilometer outcrop in the Pacific Ocean 3,700 kilometers from mainland Chile, is best known for the incredible *moai* carvings and for being the site of a man-made environmental disaster that devastated a population and culture. Today, Easter Island's population is threatened by a second environmental catastrophe. This paper focuses on ecological sustainability, looking at the problems facing the modern Easter Island (Rapa Nui), and outlines the steps that need to be taken to help the Islanders on a pathway to sustainable development.

It is widely accepted that, when Hotu Matu'a arrived somewhere around 900 AD, he found a well-forested island, with ample plant and bird life flourishing on its rich volcanic soils. Pollen analysis, archaeological and paleontological studies indicate there was an abundance of terrestrial food, even though early settlers subsisted on marine mammals. As the population grew, the island's trees were used for cooking and heating, to build boats, for cremation and ceremonies, to construct the *ahu* and to transport the *moai*, and islanders practiced slash and burn agriculture.

The Rapanui population reached its zenith of an estimated 7,000 to 20,000 during the peak *moai* period of 1200-1500 AD. A severe ecological breakdown caused by overpopulation and unsustainable environmental practices was underway, not helped by the 'mini ice age' which occurred in this period. By the end of the 16th century, the last tree was chopped down, leaving a once-rich soil open to the ravaging of wind and rain erosion. Crop production failed, and boats could no longer be built to harvest the ocean or export surplus populations. Slave raids and disease soon took out the remaining Rapanui, down to the last 110 by 1877.

Although the Rapanui have survived, the island's environment has continued to degrade. For the past 20 years, the population of Rapa Nui has been growing by 3.5% to its current level of around 3,765. In 2006, nearly 50,000 tourists visited the island, up from 5,000 just 11 years ago — a nearly 1000% increase. Tourism is projected to continue to grow by 3.9% a year. The total daily population, including tourists, is expected to reach close to 10,000 by 2010. This is around what the population was thought to have been when the first environmental collapse was in full swing. While present-day Rapanui have an advantage over their ancestors in that they have greater access to imports and a subsidized lifestyle, the need to house, feed and transport such numbers will again place significant strains on the already stressed environment. Waste management and water sanitation systems are already so inadequate that they are themselves a cause for major concern. Energy cuts are com-

mon because the system has been overloaded. There is no architectural and urban coherence in the rushed development of tourist accommodation, and certain cultural practices are unsustainable.

In recognition of the need for urgent action, the Government of Chile produced the report, "Strategy and Actions for the Conservation, and Sustainable Use of the Natural Heritage of Easter Island." It contains recommendations for sustainable development but the strategy is nowhere near implementation because there are still many obstacles to overcome.

THE KEY BARRIERS TO SUSTAINABILITY ON RAPA NUI

Rapa Nui's urgent ecological problems can be overcome with funding, modern technology, and visionary planning. However, there are important barriers to address:

- Cultural differences between Rapanui and mainland Chile.
- Limited education and public awareness on sustainability issues across both island's population, both Rapanui and mainlanders.
- Lack of skilled leaders, technicians, professionals and environmental stewards.
- Ineffective community organization and indigenous participation in decision making, even though there are six Rapanui on the island's Development Commission (CODEIPA). Further, eight Rapanui work in state institutions plus the Mayor and Governor are Rapanui.
- Division of authority with little or no coordination or communication between them concerning common problems, projects and programs, and little sharing of information.
- Lack of regulations and frameworks for implementation.
- Lack of funds. Some immediate issues threatening the Rapanui environment could be solved quickly with funding. However, where funding is available, there appears to be a lack of coherent and timely project proposals that meet funding requirements and deadlines.

Rapa Nui's isolation and geographical dependency increases the cost of implementing anything requiring the

Petra Campbell is a Visiting Research Associate at the Department of Pacific Studies a UNSW. She is founder and CEO of International Help Fund Australia (IHFA), a not-for-profit non-government organization focusing on sustainable development in the Pacific Islands.

importation of equipment or competencies, and limits the island's choice of best available technology.

THE ISLAND'S DRINKING WATER SUPPLY

The most immediate environmental threat facing Rapa Nui today is the contamination of the island's drinking water supply by: 1) solid waste in the Orito landfill, which sits directly above the Hanga Roa aquifer, and 2) the near total absence of water sanitation facilities on the island, causing untreated sewage to potentially percolate into the same aquifer. Some Chilean authorities have estimated the contamination could occur within two years. The 'Anakena aquifer has already been closed because of waste water contamination. The irreversible pollution of Rapa Nui's drinking water supply can be measured by the cost to provide an alternative source: water tanks at all homes; the importation bill for drinking water; possible drop in tourism as a result; a desalination plant; the affects of water restrictions on subsistence and commercial agriculture; or the cost of installing a water treatment facility.

SOLID WASTE MANAGEMENT

The Orito landfill was once an old quarry whose red (*hania*) soil was used to pave the Island's airstrip and roads. In 1993, the former Mayor, Alberto Hotu, approved a proposal the fill the resulting crater back up with the Island's wastes. At the time, it was apparently not known to the Mayor and the municipal council that beneath this quarry lay the four wells that make up the Hanga Roa aquifer. In 1999, the EU donated a baler to the Municipality to compress the wastes so as to maximize space in the landfill. Burying compressed bales of waste is not considered best practice today because of the danger that toxic contaminants represent to the environment, especially ground water; recycling to prolong the life of a landfill is more appropriate, especially on an island.

Typical chemical components found in landfill leachate that will potentially flow into the island's drinking water supply are known carcinogenic and mutagenics such as lead, arsenic, mercury, cadmium, benzene, vinyl chloride, trichloroethylene, chloroform, benzo pyrene, PCBs, some of these volatile organic compounds are also found in escaping landfill gases. They are found in paint and related products, pesticides, cleaning products and polishes, cosmetics, batteries and used motor oil. None of these products are sent back to Chile for processing nor are they segregated from the environment, with the exception of used motor oil and car batteries.

Today and growing significantly annually, more than 1,340 tons of combined general wastes need disposal. Added to this are 1,400 tons of green waste and 175 tons of scrap metal. Preferred best practice would be:

- All recyclable material be sorted in the home, processed on Island and exported to Chile or Tahiti (requiring around 2,400 color-coded wheelie bins for home sorting, approximately US\$ 50,000.).
- A green waste and home composting program be put into place to remove the organic residue leaching into the Hanga Roa aquifer from Orito (requires US \$100-150,000.00 for a grinder to shred green waste). Large scale composting is also a prerequisite for future reforestation and soil rehabilitation. A grinder is an urgent piece of equipment required by the island.
- The remaining non-recyclable wastes be buried in a new synthetically-lined refuse landfill; methane to be extracted to power the onsite leachate purification plant. (around US \$1,200,000.00)
- Rat and dog-proof home composting bins.
- Orito landfill to be closed down and remediated.
- Proper collection, storage and treatment of hazardous waste, pending treatment facilities in Latin America or better on-site treatment technology.
- 'In vessel' rapid composting bins for the treatment of organic wastes, dead animals and even sewage sludge. (\$18,000.00-24,000.0 for a vessel: two needed for Rapa Nui)
- Waste minimization and cleaner production practices put into place.

These things are absolutely feasible if funds were available. But there is another obstacle: Chile refuses to take the majority of recyclable wastes from Rapa Nui because of fear that dengue fever may be transmitted through the stowaway larvae of the *Aedes aegypti* mosquito. A simple low-cost, low-tech fumigation facility of Australian standards at Valparaíso would kill any larvae and protect Chile's own environment and agricultural industry from other undesirables entering from other global ports. Alternatively, recyclable wastes could be fumigated during their maritime journey to the mainland.

Incineration is also an option, but on such a small island, the issues of dioxin contamination from emissions would necessitate that the best available technology be used which requires skilled labor in running and maintaining the equipment plus easy and rapid access to spare parts.

WASTEWATER

A few hotels have septic systems but, in general, 95% of toilets on the island are pit latrines. In 2005, pit latrines were prohibited in the construction of all new houses and a subsidy of US\$2,000.00 was provided to install a septic tank. No solution has been offered for existing houses. The continued release of raw untreated sewerage into the Rapa Nui environment from the existing 1,285 houses and hotels without septic systems will contaminate the island's drinking water with viruses and bacteria, protozoa, disinfection

products, pharmaceuticals, endocrine disruptor chemicals, personal care products and other toxic chemicals that people pour down their toilets and drains.

While better than nothing, individual septic systems are less effective because they require additional grey water treatment systems, which are not budgeted for and therefore may not be installed by homeowners. They are noted for overflowing and hence contaminating the ground water anyway, and sludge must also be treated.

If septic tanks are to be installed they should be of the newer designs with fully contained disposal systems that utilizes evapo-transpiration, high PH for pathogen removal, and chemical phosphorus scavenging. At a similar cost, sophisticated low-maintenance and affordable on-site sewerage treatment systems exist in Australia, for example, which would enable several properties to hook up to the one water treatment system which also treats grey water. Properties that do not benefit from the subsidy only need to connect to the system via pipes. Sludge only requires removal every seven years or so and can be dried and composted in in-vessel rapid composting bins. Composting toilets could be used on distant properties outside the communal system where there is no running water.

SOIL EROSION

The total loss of tree cover and overgrazing of the island by 60,000 head of sheep in the late 19th century to mid 20th century was a catastrophe for the island's soil. In prehistoric times, and following the toppling of the *moai*, one adaptation technique used by the Rapanui to protect the soil was mulching with stones. This practice has been lost to the island today.

The accumulation of horses and cows by the locals who consider them a status symbol is a serious problem, as is the unnecessary presence of some 600 aging cows on Poike that belong to the Sociedad Agrícola y de Servicios Isla de Pascua (SASIPA), because 90% of the Islands meat is imported from the mainland.

SASIPA plans to return the land to the Rapa Nui but no coherent development proposal has been put forward by CODEIPA as yet. The island is overgrazed while the habit of burning grass to grow shoots for livestock is accelerating the problem because it exposes the ground to heavy rains and wind which wash and blow the topsoil away, causing the deep ravines visible around the island. Two hundred and six hectares of the island is without any vegetation, that is, desert. A lot of this is on the tops and sides of Rapa Nui hills. This is catastrophic for an island the size of Rapa Nui: on Poike, 300 of its 1400 hectares is severely eroded, with ravines 6 meters deep and 50 meters wide. Of the 14,238 hectares (86% of the island) covered with vegetation, 78% is in a state varying from degradation to very degraded. Only 3,911 hectares of the whole island in a normal state.

FLORA AND FAUNA

Studies indicate there would have originally been more than a hundred endemic plant species. More than half are now extinct. Overgrazing, man-made grass fires and invasive plants are threatening the remaining rare species and reducing existing populations, while the lack of awareness on the island of these rare species contributes to the lack of conservation action. There are 63-68 presumed indigenous species. A third of those have disappeared, maybe more because species can disappear without leaving a trace. Eighteen species are Polynesian introductions and are considered part of the flora heritage as they are believed to have been introduced by Hotu Matu'a. Of the total number there are 437 species, 85% of them introduced, and 80% of those are modern introductions, less than 100 years ago. Seventeen remaining threatened species have been tabled. The rarest endemic species are found in the volcanoes, especially in Rano Kau and Rano Aroi, on the *motu*, and on cliff sides inaccessible to herbivores.

As for fauna, there is very little left to speak of. Rats are the only wild species on island and are reaching plague levels. There are five species of introduced birds, no amphibians, two types of Polynesian reptile, one fresh-water fish species introduced to eat mosquito larvae in the 1940's. Of the invertebrates there are 142 species, introduced from Chile or Polynesia. (Mideplan Gobierno de Chile)

In 2006, ONF International, the Commission for the Development of Easter Island, (CODEIPA) and other local offices piloted the "Sustainable Management of the Natural Resources of Rapa Nui" project with objectives to restore tree cover, sustainable management of stockbreeding, and the canalization of tourists. Drinking troughs and Australian x's (metal grids that prevent animal access) were put into place to stop cattle and horses from trampling around monuments in Tahai and Rano Raraku; two tree types were planted in Poike over a demonstration area; and two land-owners were assisted with agro-forestry. The Chilean National Parks Authority (CONAF) launched a nursery to produce 20,000 native and Polynesian plants in the first year. The project was a pilot. It requires further funding to be rolled out. One critical issue with the implementation of the livestock management project was the perception by locals that Chile was interfering with their culture and lifestyle by attempting to control where their cows and horses fed and drank: as the locals have so much livestock and not enough land to graze them on, they put them on other land, such as the National Parks. It is the job of CONAF to protect monuments and the biodiversity in the national parks. Meanwhile the Rapanui are waiting for the planned restitution of Poike and other state-owned land. This exercise demonstrates a great need for a full-scale public education and consultation on the very serious issues facing Rapa Nui today, and the need to coherently plan for the future. The ONF project recommended:

- Widespread dissemination of available scientific information and public education.
- A strategic managed-approach to animal husbandry according to the carrying capacity of the island, and the cessation of grass fires or a rigorous control of them.
- Eradication of all wild goats.
- A concerted mechanical or chemical assault on invasive plants in the natural environment.
- Fencing off and protection of remarkable natural areas to allow for regeneration, notably in the volcano craters.
- Nurseries, plantations and the widespread distribution of seeds to the public.
- Reforestation and the reintroduction indigenous species of trees from Polynesia and European Botanical Gardens, like the *makoi* and the *toromiro*.
- Eventual eradication of the eucalyptus forests.

DEPLETION OF MARINE RESOURCES

Rapa Nui is in the least dense zone for plankton in the whole Pacific. (Scientific Study Franco-Chilean Atlanta Mission, Nov. 2004). This is what gives Rapa Nui's water such clarity. The average temperature of 22C favors low diversity of coral while strong winter storms prevent the formation of sea level coral reefs to house and protect coastal sea life, except for a few areas around the island. What remains is a meager marine ecosystem of mixed deep sea and coral reef flora and fauna. This scant belt of sea life is just 100 to 300 meters wide from the shore to a depth of 20-40 meters all around the island. To illustrate the island's marine poverty, Rapa Nui has 65 recorded families of fish, where French Polynesia has 300 and New Caledonia has 1000 (Hubbard and Garcia 2003).

Rapa Nui's coast underwent similar successions of ecological crises. Dynamite fishing caused the total extinction of all the species that lived in the areas where it was practiced. In 1982 and 1983, El Niño came, killing off 90% of the algal forest and causing irreversible damage to the marine ecosystem. When the valley of algae died, parrot fish and other species disappeared. The introduction in the 1970-80's of modern fishing equipment and light-assisted night diving for lobster and other species then caused the ongoing overexploitation of lobster, sea cricket, octopus, and eel (Garcia 2004).

The multiplication of small fishing boats from thirty in 1980 to 100 in 2004 has increased the number of people accessing fish stocks, while improvements in the various coves around the island facilitated the development of intensive subsistence/recreational fishing. Road improvements in the 1990's also opened access to coastal fishing spots previously difficult to access. The indiscriminate use of fishing nets, whose lines went from 6 inches in 1980 to 4-4.5 inches in 1990, lead to the overexploitation of the

mahito and *nanue* species while the increase of tourism has significantly increased the volume of fish needed by the island (Garcia 2004).

When the algae virtually disappeared during El Niño, it was replaced in less than a decade by a shallow water coral community. In 2000, the La Niña — associated warming — induced widespread bleaching, decimating the then-flourishing *Pollopora verrucosa* coral community. It also caused the widespread death of zoo-plankton, the first in line on the carnivorous food chain. Coral is also sold to tourists; especially the *P. verrucosa* whose numbers have already dwindled. The rare coral, *Pollopora eydouxi*, has also been seen by scientists for sale in public markets (Michelle Garcia). The anchoring of large supply vessels off the coast of 'Anakena caused massive damage to coral gardens in just one day, August 25, 1999. This coral community took close to a century to form (Hubbard and Garcia 2003). Measures to prevent further depletion of coastal resources:

- Public education
- Limits on marine harvests and a plan for sustainable management.
- Permanent moorings be installed to prevent coral damage altogether.

Michel Garcia, Orca Diving Centre and film maker/scientific researcher, helped create three Marine Parks of Easter Island in 1998, in collaboration with the Chilean Navy. However, these parks are impossible to police because of their isolation. He is now lobbying for a 100 hectare Marine Reserve project that can be effectively monitored. Public consultation is still ongoing as it is a popular fishing and recreation zone.

SUSTAINABLE ENERGY

Easter Island's dependence on fossil fuels and the size of the island electricity load have led to high electricity costs, even though electricity is subsidised by mainland Chile, and potential environmental damage from oil spills and air pollution. The current situation can only get worse with international predictions on the future price and availability of oil, and climate change outcomes such as carbon pricing. Easter Island is currently supplied by a small grid network powered by diesel generators. The island imports 1,800 cubic meters of gasoline, 7,800 cm's of aviation kerosene and 2,300 cm's of diesel oil every year. Although SASIPA says there have been no shortages registered in the last 20 years, there were 5 or 6 shut downs according to them. SASIPA has appointed a private technical engineering company from the Chilean Grupo GTD to submit a report on the prospects of using renewables in Easter Island. The report is expected to be completed in March. SASIPA and the Governors office is very serious about implementing a sustainable energy project using renewable energy on the Island. Commercially available technology off the shelf could fix not only their energy problems but also their water

problems. IHFA in partnership with Dr Bruce Robins, the former Australian head of BP Solar, has proposed a Public Private Partnership (PPP) as a Build, Own, Operate, and Transfer (BOOT) project. However, once the report is through from GTD, authorities will tender.

TOURISM

Nearly half of Rapa Nui is a UNESCO-listed World Heritage National Park. The industry employs around a third of the Rapa Nui population, even more during peak season. Tourism is one of the biggest players in Rapa Nui's sustainability equation: they can help solve the problem or they can help repeat Rapa Nui's tragic history with a contemporary twist. Tourists bring in money and help raise the Rapa Nui living standards but they also bring in waste and require infrastructure. They consume on island and leave their organic solid and liquid wastes behind.

The fact that the archaeological sites are neither fenced off nor framed with modern signage as in most parts of the world is one of the greatest charms of the island. But the growing number of tourists is now requiring some methodical organization so they do not degrade the sites, such as places to sit (not on the monuments and *ahu*), places to shelter (not inside the monuments) places to park (not on the disappearing flora and fragile soils) and delineated pathways to walk on.

Rapa Nui is an expensive and sought-after destination by mostly cultural tourists. Any sterilization of the experience may degrade the industry, while overdevelopment will change the face of Rapa Nui altogether. The lack of a clear vision and consensus on tourism development has led to proposals in the past and present to implant Hawai'i type developments on island. But do the Rapanui want their island to look like Guam, or do they want to preserve their island as an ecotourism destination?

The carrying capacity of Rapa Nui has been estimated at 18,767 with the extra daily real population of tourists at 2,207. The actual number of people per day on the island projected for 2010 is 4,944 residents and 4,802 tourists (Mideplan, Gobierno de Chile). But what happens after 2010 with the current population and tourism growth rates? Just because 18,767 is the maximum carrying capacity, does Rapa Nui have to accept that as inevitability?

Or could Rapa Nui be proactive and limit the number of tourists to a comfortable number? This would maintain a quality of life communally-decided upon and aspired to, taking into account the number of permanent residents, number of livestock, and availability of resources, energy, water sanitation, waste management, infrastructural requirements for the delivery of utilities, aesthetics of the island, preservation of the cultural heritage, and other economic activities. There are now limits on the number of Chileans and foreigners who can live on the island, which in itself will relieve other tensions. Local fertility rates will need to be addressed one day. Even if there are five to eight Rapanui men per women (it is the women who tend to migrate

to the mainland), a population growth of 3.5% is not sustainable on an island in the long term, unless, in the traditional Polynesian fashion, surplus people are being exported.

CONCLUSION

The Earth and its sense of belonging to the cosmic world, political representation through the council of elders, the Rapanui language, ancestral patrimony, reciprocity and the family, are all essential elements of Rapanui identity. All or part of these are undergoing various stages of evolution from continuity to hybridization to rupture, but they are all closely intertwined with the environment. Policies that strengthen the Rapanui culture should form the basis of a sustainability approach to the island.

One of the biggest hurdles will be to bring together the various centers of public power and authority on island. The Municipality, the Governor's Office, the Navy, the National Corporation for the Development of Indigenous People (CONADI), the Commission for Development (CODEIPA), the Council of National Monuments, the Chilean National Parks Authority (CONAF), Sociedad Agrícola y de Servicios Isla de Pascua (SASIPA), the Ministry of Health, Council of Elders, and UNESCO are all the diverse local, national and international specialized bodies charged with managing the island or influencing it.

At the moment there is very little communication, information, or resource-sharing between these entities. The final decision on how the island is managed could, in the words of the Mideplan Report on Sustainable Development, end up "all Chilean, or all Rapanui". Or everyone could put their heads together and, along with Rapanui civil society, jointly develop and implement a coherent development plan to conserve, rebuild, and enhance the existing natural, cultural and man-made heritage for the generations who will come after them.

To date for Rapa Nui, International Help Fund Australia has accomplished the following:

- Facilitated the Société Environnement Polynésien to develop a concrete proposal for the management of waste in Rapa Nui, including a training visit to Tahiti;
- With the Société Environnement Polynésien, provided dedicated bins for the storage of used motor oil, car batteries and recreational batteries
- With the Société Environnement Polynésien made two public education TV commercials, as well as creating brochures and posters;
- Provided second dedicated study on scrap metal processing and recycling;
- Provided oxycutting equipment and OH&S gear for the processing of scrap metal;
- Hosted CONAF to Australian National Parks to see how waste water is managed; with funding

from, the Easter Island Foundation and freight sponsorship from LAN Airlines. Air Tahiti Nui provided CONAF with one public composting toilet for the new Orongo Visitors' Centre and a demonstration domestic model;

- Produced four fundraising videos and three promotional videos of Rapa Nui;
- Posted a Rapa Nui artist at an international art fair in Australia; and
- Provided the local TV with an English learning program to help develop English speaking tour guides.
- Provides ongoing consultation to many bodies on the island.

Anyone wishing to support our efforts please send us your donations. We are looking for funds to purchase wheelie bins, two Biobins, and funds to fly specialists to the Island to produce action plans for alternative energy and water sanitation. If you can help with equipment, please contact Petra Campbell directly:

Email: kpmmm@ozemail.com.au
 Web: www.internationalhelpfund.org
 Funds can be sent to: IH Easter Island Fund
 Wespac, 783 Old South Head, Road. Rose Bay. 2029.
 NSW. Australia.
 BSB and Account No: 0320 5820 5929
 Swift Code: WPACAU2S

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